

JBA
consulting

Cotswold District Council Sequential Test

Final Report

September 2014

Cotswold District Council
Trinity Road
CIRENCESTER
Gloucestershire
GL7 1PX



COTSWOLD
DISTRICT COUNCIL

JBA Project Manager

Giovanni Sindoni
 Crowmarsh Battle Barns
 100 Preston Crowmarsh
 Wallingford
 Oxfordshire
 OX10 6SL

Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1.0 (9 July 2014)		CDC, EA
Draft v2.0 (20 August 2014)	Amended following review comments from CDC and EA.	CDC, EA
Draft v2.1 (29 August 2014)	Amended following additional comments from CDC.	CDC
Draft v2.2 (11 September 2014)	Amended following additional comments from CDC.	CDC, EA
FINAL v3.0 (17 September 2014)	Issued following approval of draft from CDC and EA	CDC, EA
FINAL v3.1 (30 September 2014)	Amendments to formatting errors	CDC, EA

Contract

This report describes work commissioned by the Cotswold District Council, by an email dated 16/06/2014. The council's representative for the contract was Joanne Corbett. Giovanni Sindoni and Paul Eccleston of JBA Consulting carried out this work.

Prepared by Giovanni Sindoni MSc
 Senior Analyst

Reviewed by Paul Eccleston BA CertWEM CEnv MCIWEM
 C.WEM
 Technical Director

Purpose

This document has been prepared as a Final Report for Cotswold District Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Cotswold District Council.

Acknowledgements

We would like to thank everyone who has assisted in the development of this Sequential Test study, including: Joanne Corbett from Cotswold District Council, Sophie Ashley Maltman and Oliver Roden from the Environment Agency.

Copyright

© Jeremy Benn Associates Limited 2014

Carbon Footprint

A printed copy of the main text in this document will result in a carbon footprint of 115g if 100% post-consumer recycled paper is used and 147g if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex.

JBA is aiming to reduce its per capita carbon emissions.

Contents

1	Introduction	1
2	National Planning Policy Framework	3
2.1	The Sequential Test.....	4
2.2	NPPF Flood Zones	5
2.3	NPPF Flood Risk Vulnerability Classification	8
2.4	NPPF Flood Risk Vulnerability and Flood Zone Compatibility	9
3	Methodology	10
4	Results	12
4.1	SHLAA sites.....	23
4.2	SELAA sites	24
4.3	SHLAA settlements.....	24
4.4	SELAA settlements.....	24
5	Conclusion	25

List of Figures

Figure 2-1: Application of the Sequential Test for Local Plan preparation.	4
Figure 2-2: Application of the Exception Test for Local Plan preparation.	5
Figure 4-1: The importance of site layout when considering flood risk constraints.....	12

List of Tables

Table 2-1: NPPF Flood Zones and appropriate uses.	6
Table 2-2: Flood Risk Vulnerability Classification "Table 2".....	8
Table 2-3: Flood Risk Vulnerability and Flood Zone 'Compatibility'.	9
Table 3-1: Risk scoring.	10
Table 3-2: Potential surface water constraints based on the percentage of site within the 1 in 1000 year FMfSW outline.....	11
Table 4-1: Sequential Test for SHLAA sites.....	13
Table 4-2: Sequential Test for SELAA sites.....	18
Table 4-3: Sequential Test for SHLAA settlements.....	20
Table 4-4: Sequential Test for SELAA settlement.....	22

Abbreviations

AStGWF.....	Area Susceptible to Groundwater Flooding
CDC.....	Cotswold District Council
EA.....	Environment Agency
FMfSW.....	Flood Map for Surface Water
FZ.....	Flood Zone
HFM.....	Historic Flood Map
LPA.....	Local Planning Authorities
NPPF.....	National Planning Policy Framework
SELAA.....	Strategic Employment Land Availability Assessment
SHLAA.....	Strategic Housing Land Availability Assessment
SFRA.....	Strategic Flood Risk Assessment
WCS.....	Water Cycle Study

This page is intentionally left blank

1 Introduction

The National Planning Policy Framework (NPPF)¹ and the accompanying Planning Practice Guidance on Flood Risk and Coastal Change requires local planning authorities (LPA) to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding.

The Sequential Test looks at the risk of flooding of each site in order to enable planners to steer development. Its aim is to steer new development to areas with the lowest probability of flooding.

Cotswold District Council (CDC) has identified 92 Strategic Housing and Land Availability Assessment (SHLAA) and 34 Strategic Employment and Land Availability Assessment (SELAA) potential development sites. These sites are the ones considered for the Strategic Flood Risk Assessment (SFRA) completed in July 2014 and the Water Cycle Study (WCS) that is still ongoing at time this report has been wrote.

The Sequential Test carried out in this study is appropriate for informing the allocation of housing and employment sites. The Sequential Test does not need to be applied again for individual developments on sites which have been allocated in development plans through the Sequential Test. However, where allocated sites contain areas of flood risk, their site-specific Flood Risk Assessments (FRAs) should demonstrate that the site has been sequentially planned, and some sites will require an Exception Test to be passed. On a small number of sites, flooding presents a major constraint, suggesting they might not be suitable for development.

This document does not intend to replicate the information already contained in the SFRA and the latter should be referred to for further information for example on guidance for planners and developers.

¹ National Planning Policy Framework (NPPF): <http://planningguidance.planningportal.gov.uk>
2014s1264 Cotswold DC - Sequential Test Final v3-1

This page is intentionally left blank

2 National Planning Policy Framework

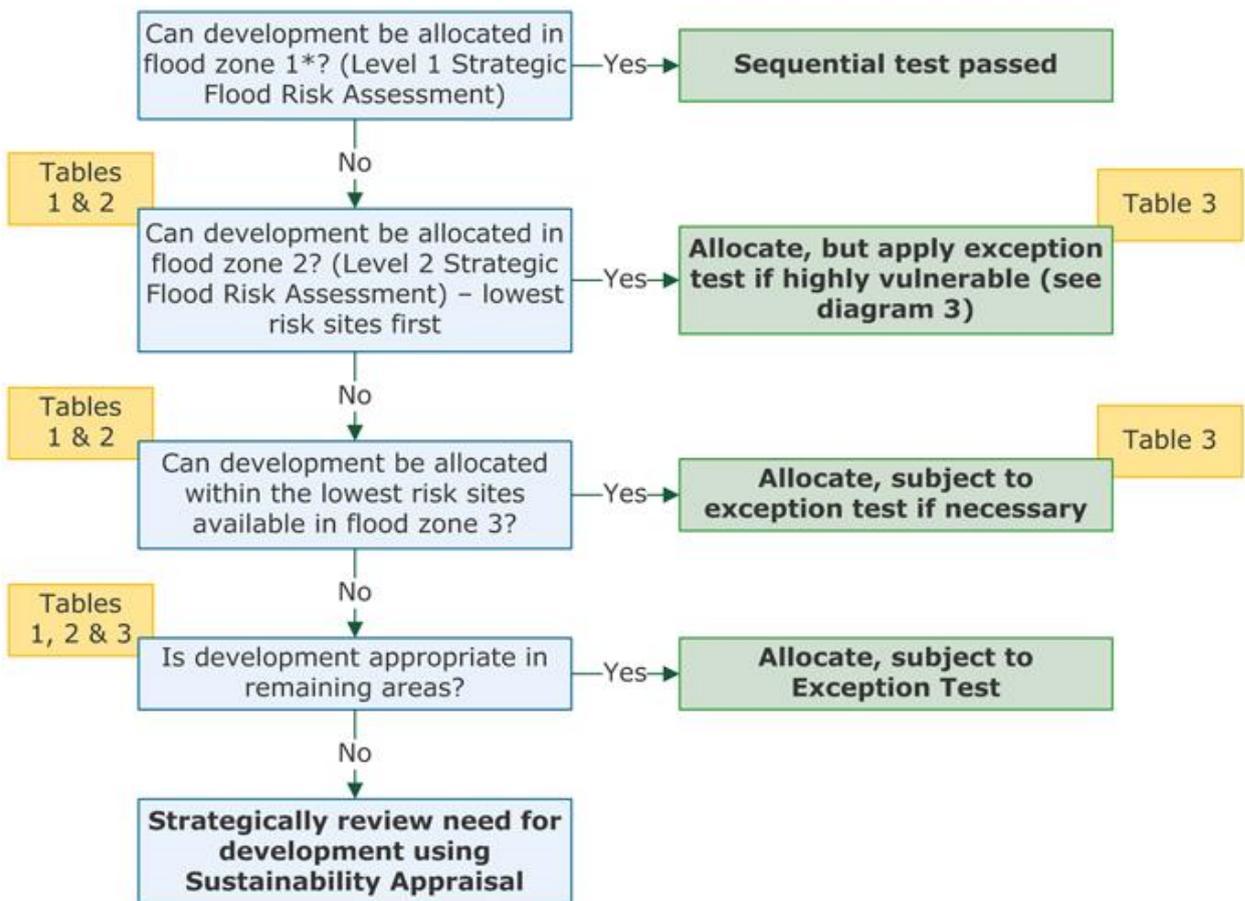
The NPPF was introduced by the Department for Communities and Local Government in March 2012 and supersedes the Planning Policy Statements. The NPPF considers flood risk to developments using a sequential characterisation of risk, based on the Environment Agency (EA) Flood Zone maps.

2.1 The Sequential Test

The Sequential Test aims to steer development towards areas with low flood risk, and to direct more vulnerable developments away from flood risk zones. The Local Planning Authority's (LPA's) Strategic Flood Risk Assessment (SFRA) is produced to help guide development and forms the basis for the application of the Sequential Test.

When planning a development a sequential approach should be applied to identify suitable sites which are at minimal risk from flooding, avoiding Flood Zones 2 and 3 where possible. The overall aim of decision-makers should be to steer new development to Flood Zone 1. If no suitable areas can be identified in Flood Zone 1 then sites with the lowest flood risk should be considered next (see Figure 2-1 - "Table 1, 2 & 3" are defined in the next paragraphs see Table 2-1, Table 2-2 and Table 2-3).

Figure 2-1: Application of the Sequential Test for Local Plan preparation.

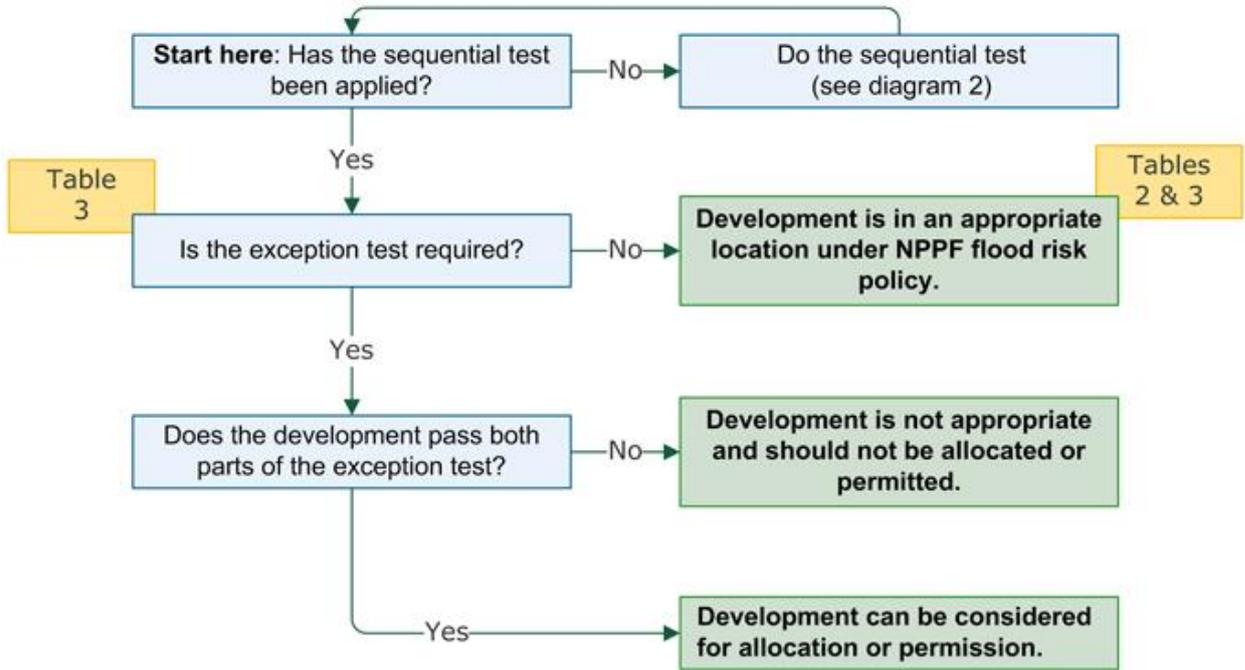


Source: Diagram 2, NPPF Technical Guidance

In this case the Exception Test (see Figure 2-2) will also be required if the development falls in specific "Vulnerability Classification" as defined in

Table 2-3.

Figure 2-2: Application of the Exception Test for Local Plan preparation.



Source: Diagram 3, NPPF Technical Guidance

The Sequential Test carried out at this stage is at a broad scale level because the type of development and the exact boundary of each site are not known. However, this can be used as guidance when planning future development at a strategic level.

2.2 NPPF Flood Zones

Table 2-1 shows how the Flood Zones relate to a sequential planning response. There are advisory notes placed upon this type of development, which are detailed in Table 2-2. Details of permitted development and Exception Test requirements are provided in

Table 2-3.

Table 2-1: NPPF Flood Zones and appropriate uses.

Zone 1: Low Probability	
<p>Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).</p>	<p>Appropriate uses All uses of land are appropriate in this zone.</p> <p>FRA requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless factors above or other local considerations require particular attention.</p> <p>Policy aims Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.</p>
Zone 2: Medium Probability	
<p>Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.</p>	<p>Appropriate uses The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 2-2 are appropriate in this zone. Highly vulnerable uses in Table 2-2 are only appropriate in this zone if the Exception Test is passed.</p> <p>FRA requirements All proposals in this zone should be accompanied by a FRA.</p> <p>Policy aims Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.</p>

Continued overleaf...

Zone 3a: High Probability	
<p>Land assessed as having a 1 in 100 or greater probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.</p>	<p>Appropriate uses The water-compatible and less vulnerable uses of land in Table 2-2 are appropriate in this zone. The highly vulnerable uses in Table 2-2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table 2-2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.</p> <p>FRA requirements All proposals in this zone should be accompanied by a FRA.</p> <p>Policy aims Developers and local authorities should seek opportunities to:</p> <ul style="list-style-type: none"> • reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land in zones with a lower probability of flooding; • create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.
Zone 3b: Functional Floodplain	
<p>Land where water has to flow or be stored in times of flood.</p> <p>Local Planning Authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designated to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify functional floodplain.</p>	<p>Appropriate uses Only the water-compatible uses and the essential infrastructure listed in Table 2-2 that has to be there should be permitted. It should be designed and constructed to:</p> <ul style="list-style-type: none"> • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows; and • not increase flood risk elsewhere. <p>Essential infrastructure in this zone should pass the Exception Test.</p> <p>FRA requirements All proposals in this zone should be accompanied by a FRA.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to:</p> <ul style="list-style-type: none"> • reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land with a lower probability of flooding.

Source: Table 1, NPPF Technical Guidance

2.3 NPPF Flood Risk Vulnerability Classification

Table 2-2 shows the Flood Risk Vulnerability Classification as presented on "Table 2" NPPF Technical Guidance.

Table 2-2: Flood Risk Vulnerability Classification "Table 2".

Essential Infrastructure	<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	<ul style="list-style-type: none"> • Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use (Sequential and Exception Tests required for any change of land use to these sites). • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "Essential Infrastructure").
More Vulnerable	<ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels • Non-residential uses for health services, nurseries and educational establishments • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravan and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	<ul style="list-style-type: none"> • Police, ambulance and fire stations which are not required to be operation during flooding. • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works and which do not need to remain operation during times of flood. • Sewerage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible Development	<ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Source: Table 2, NPPF Technical Guidance

Notes:

1. This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2) and also on the need of some uses to keep functioning during flooding.
2. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
3. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

2.4 NPPF Flood Risk Vulnerability and Flood Zone Compatibility

Table 2-3 shows the Flood Risk Vulnerability and Flood Zone Compatibility as presented on "Table 3" NPPF Technical Guidance. The table defines what is / is not allowed in each Flood Zone and if the Exception Test is needed.

There are two elements to the Exception Test, both of which need to be passed for a site to be allocated or permitted:

- a. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
- b. A site-specific flood risk assessment (FRA) must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible reducing flood risk overall.

Table 2-3: Flood Risk Vulnerability and Flood Zone 'Compatibility'.

Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test	✓	✓
	Zone 3a	Exception Test	✓	✗	Exception Test	✓
	Zone 3b	Exception Test	✓	✗	✗	✗

Source: Table 3, NPPF Technical Guidance

- ✓ Development is appropriate
- ✗ Development should not be permitted

Notes to

Table 2-3:

This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea.

The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site.

Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

** In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

remain operational and safe for users in times of flood;

result in no net loss of floodplain storage;

not impede water flows and not increase flood risk elsewhere.

3 Methodology

The methodology adopted in this study to carry out the Strategic Sequential Test is summarised by the following steps:

- Calculate the percentage of the site inside the fluvial Flood Zones and the Flood Map for Surface Water outlines² available using the JBA flood risk metrics tool FRISM.
- Define a scoring system based on the type of flood outline to classify each site.
- Assign a score to each site.
- Highlight if an Exception Test would be required.
- Integrate the score with comments from the SFRA report.

3.1.1 Risk Scoring

The flood outlines available were fluvial Flood Zones (FZ) 2 and 3, the updated Flood Map from Surface Water (uFMfSW) and Historic Flood Map (HFM). The latter was not considered because in many cases the historic outlines have been included within Flood Zones 2 or 3. These same outlines were used for the CDC SFRA.

The following scoring system has been assigned for each flood outline:

Table 3-1: Risk scoring.

Flood Map Type	Flood Outline (FO)	Probability	Partial Score	Sub-Score	Total Score
Flood Zone	FZ3b	5.00	% site area in FO * Probability	Sum of all Partial Scores	Sum of all Sub-Score
	FZ3a	1.00	% site area in FO * Probability		
	FZ3a +CC	0.50	% site area in FO * Probability		
	FZ2	0.10	% site area in FO * Probability		
Flood Map for Surface Water	FMfSW 30 yr	3.33	% site area in FO * Probability	Sum of all Partial Scores	
	FMfSW 100 yr	1.00	% site area in FO * Probability		
	FMfSW 1000 yr	0.10	% site area in FO * Probability		

A partial score for each flood outline was assigned to a site by multiplying its percentage of area affecting the site for its probability. A Sub-Score is then calculated for each Flood Map Type (FZ and FMfSW) together with a Total Score by adding all the two Sub-Scores.

The scoring system was defined taking into consideration the NPPF practice guidance which recommends that “other forms of flooding should be treated consistently with river flooding in mapping probability and assessing vulnerability to apply the sequential approach across all flood zones.”

3.1.2 Assessment of surface water constraints

A separate assessment has been made to identify the potential surface water drainage constraints on a site, based on the percentage of the site located within the 1 in 1000 year FMfSW outline. Due to the nature of surface water flooding and the FMfSW, almost all sites have at least some of their area within this flood risk outline. The fact that a site has a high percentage of its area within this outline does not necessarily preclude development, however it is probable that more investment will be required in drainage infrastructure and the land-take needed to manage surface water flooding will be greater than on a site with a low percentage of its area at risk. The categorisation used is shown in Table 3-2.

² The Flood Map for Surface Water outlines define areas modelled to be at risk of flooding to a depth of 0.15m or greater for the given event probability.

Table 3-2: Potential surface water constraints based on the percentage of site within the 1 in 1000 year FMfSW outline.

% of site in FMfSW	Potential surface water drainage constraints
0	Extremely low
0-5	Very low
5-20	Low
20-50	Medium
50-75	High
>75	Very high

3.1.3 Calculation of potential housing units within Flood Zone 1

For the SHLAA settlements with one or more sites in FZ2 an estimation of how many houses could be allocated in FZ1 was calculated by multiplying the area in FZ1 by an average housing density of 25 houses per hectare. This estimation is used in this study only as an indication of the level of constraints that the settlement may present according to the number of houses proposed. Where this estimate number is lower than the planned number the reason may be due to the fact that the average density of 25 houses / hectares is too low for the sites concerned. Other planning considerations (transport, public services, environmental impact etc.) are not taken into account.

3.1.4 Other sources of flood risk

Information on risk of flooding from groundwater, reservoir and sewer for settlements were sourced from the SFRA. These were used to make additional subjective comment but were not included in the score. The Area Susceptible to Groundwater Flooding (AStGWF) map was used to assess the risk from groundwater.

4 Results

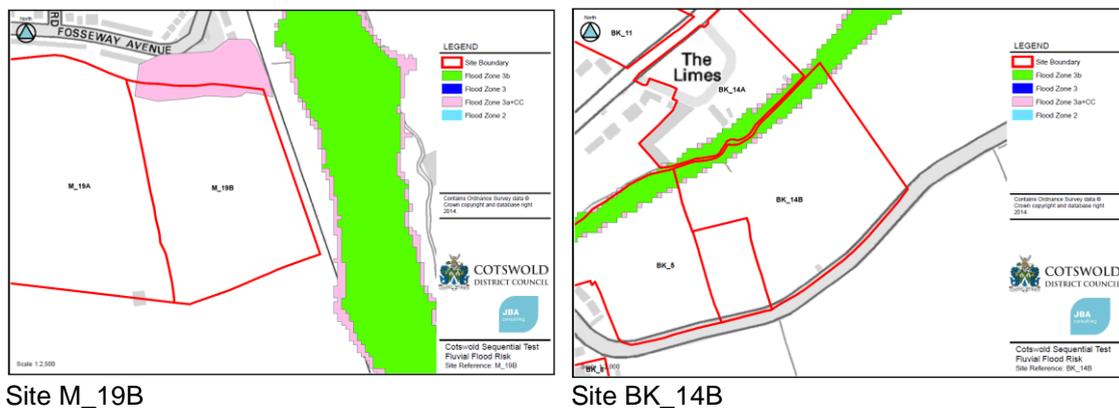
Table 2-1 and Table 4-2 show the Strategic Sequential Test for each site for SHLAA and SELAA respectively. These are ordered by settlements. The tables are also provided in excel so that the user can reorder them as convenient. Fluvial and pluvial maps are provided for each site and can be opened by clicking the relevant hyperlinks on the tables. Table 4-3 and Table 4-4 summarise the results for each settlement for SHLAA and SELAA sites.

The scoring system can be used to quickly identify site with likely constraints, however these are only an indicator of potential constraints. In general, considering sites with fluvial risk:

Percentage of site in Flood Zone 1	Likely constraints on development
>95%	Very unlikely to be a constraint to development as long as access to the site can be maintained
90-95%	Unlikely to be a constraint to development as long as access to the site can be maintained
80-90%	Some constraint is likely for example housing numbers may be reduced
<80%	Flood risk may form a significant constraint to development.

Using this as a guide, each site was considered individually as the actual degree of constraint may vary according to the geography of the site and flooding. For example, site M_19B has around 5% of its area in FZ3a (considering climate change), but this covers the north side of that site where access may be required. Site BK_14B has a similar percentage of its area in FZ3b, but this would not affect access to and from the site and is therefore less likely to constrain development of the site.

Figure 4-1: The importance of site layout when considering flood risk constraints



The results show that there are different sites where a Detailed Sequential Test is needed when planning applications are put forward but few sites seem to present significant constraints to make them unsuitable for that development or prevent them to accommodate the houses planned. At a settlement level generally it seems to be enough room to locate the potential houses planned.

It is important to highlight that the results here presented are based only on the risk of flooding and that when a detailed assessment of a site is carried out other information may prove that this might not be suitable for development due to other constraints.

This page is intentionally left blank

Table 4-1: Sequential Test for SHLAA sites

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Total units planned	Area ha	Area ha in FZ1	Potential houses in FZ1	Sequential test for single site	Link to fluvial map	Link to pluvial map
Andoversford	A_2	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	22	2.31	2.31	57	No constraints	Open fluvial map	Open pluvial map
Andoversford	A_3A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	19	1.54	1.54	38	No constraints	Open fluvial map	Open pluvial map
Blockley	BK_11	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	36	1.46	1.46	36	No constraints	Open fluvial map	Open pluvial map
Blockley	BK_14A	11.49	11.49	12.95	12.95	87.05	2.05	2.82	12.25	76.71	10.87	87.58	Low	37	1.51	1.32	32	A significant area of the site lies within FZ3b and 3a. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site will be necessary.	Open fluvial map	Open pluvial map
Blockley	BK_14B	6.15	6.15	6.78	6.78	93.22	3.61	6.28	15.18	40.97	19.82	60.79	Low	63	3.34	3.12	77	A small area of the site is within FZ3b, 3a and 2. If building is avoided within this area, development of the site should not be constrained.	Open fluvial map	Open pluvial map
Blockley	BK_5	10.62	10.62	11.55	11.55	88.45	1.75	3.67	11.76	70.65	10.67	81.32	Low	22	2.30	2.03	50	A significant area of the site lies within FZ3b and 3a. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site will be necessary.	Open fluvial map	Open pluvial map
Blockley	BK_8	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	13	0.54	0.54	13	No constraints	Open fluvial map	Open pluvial map
Bourton-on-the-Water	B_20	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	24	0.30	0.30	7*	No constraints	Open fluvial map	Open pluvial map
Bourton-on-the-Water	B_32	0	0	0	0	100	0	0.9	5.52	0.00	1.45	1.45	Low	32	1.29	1.29	32	Flood risk from other sources	Open fluvial map	Open pluvial map
Broad Campden	R_432	0	0	0	0	100	3.32	6.26	16.84	0.00	19.00	19.00	Low	19	0.77	0.77	19	Flood risk from other sources	Open fluvial map	Open pluvial map
Broad Campden	R_484	0	0	0	0	100	0	1.18	7.82	0.00	1.96	1.96	Low	28	1.15	1.15	28	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_23B	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	34	1.37	1.37	34	No constraints	Open fluvial map	Open pluvial map
Chipping Campden	CC_23C	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	80	4.22	4.22	105	No constraints	Open fluvial map	Open pluvial map
Chipping Campden	CC_23E	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	21	0.86	0.86	21	No constraints	Open fluvial map	Open pluvial map
Chipping Campden	CC_38A	0	0	0	0	100	0	0	3.98	0.00	0.40	0.40	Very Low	8	0.26	0.26	6*	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_40	0	0	0	0	100	0	0	0.02	0.00	0.00	0.00	Very Low	28	1.13	1.13	28	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_41	0	0	0	0	100	0	0.93	10.55	0.00	1.99	1.99	Low	43	1.74	1.74	43	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_43	0	0	0	0	100	0	1.55	9.5	0.00	2.50	2.50	Low	48	1.85	1.85	46*	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_44	0	0	0	0	100	1.51	2.64	14.46	0.00	9.11	9.11	Low	45	1.80	1.80	45	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_48	0	0	0	0	100	0	0.01	3.42	0.00	0.35	0.35	Very Low	8	1.08	1.08	27	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_51	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	22	0.89	0.89	22	No constraints	Open fluvial map	Open pluvial map
Chipping Campden	CC_52	0	0	0	0	100	0	1.02	5.17	0.00	1.54	1.54	Low	32	1.31	1.31	32	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CC_53	0	0	0	0	100	5.17	5.85	8.64	0.00	23.93	23.93	Low	27	1.11	1.11	27	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_101A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	9	0.10	0.10	2*	No constraints	Open fluvial map	Open pluvial map
Cirencester	C_111	0	0	0	0	100	0	0	3.1	0.00	0.31	0.31	Very Low	24	1.93	1.93	48	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_17	0	0	0	0	100	0	0	0.16	0.00	0.02	0.02	Very Low	6	0.18	0.18	4*	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_173	0	0	0	0	100	0	0.02	5.5	0.00	0.57	0.57	Low	7	0.27	0.27	6*	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_174	0	0	0	0	100	0	0	1.6	0.00	0.16	0.16	Very Low	15	0.62	0.62	15	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_39	0	0	0	0	100	2.55	9.19	27.19	0.00	20.40	20.40	Medium	9	0.29	0.29	7*	Flood risk from other sources. Potential for surface water drainage constraints are indicated at this site.	Open fluvial map	Open pluvial map
Cirencester	C_75	0	0	0	0	100	0.3	0.53	3.44	0.00	1.87	1.87	Very Low	2500	110.10	110.10	2752	Flood risk from other sources	Open fluvial map	Open pluvial map

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Total units planned	Area ha	Area ha in FZ1	Potential houses in FZ1	Sequential test for single site	Link to fluvial map	Link to pluvial map
Cirencester	C_76	0	0	0	0	100	0.5	0.91	5.55	0.00	3.13	3.13	Low	8	2.64	2.64	66	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_82	0	0	0	0	100	0	0	2.45	0.00	0.25	0.25	Very Low	23	0.94	0.94	23	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_84B	0	0	0	0	100	0.66	1.59	4.12	0.00	4.20	4.20	Very Low	30	3.14	3.14	78	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	C_89	0	6.47	31.54	88.47	11.53	0	0.01	1.25	31.09	0.14	31.22	Very Low	18	1.18	0.14	3	A significant percentage of the site lies within FZ3b and 3a, with most of the remainder of the site within FZ2. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Significant flood risk. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site will be necessary.	Open fluvial map	Open pluvial map
Cirencester	C_97	0	0	0	0	100	0	0	0.3	0.00	0.03	0.03	Very Low	11	0.38	0.38	9*	Flood risk from other sources	Open fluvial map	Open pluvial map
Down Ampney	DA_1A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	24	0.97	0.97	24	No constraints	Open fluvial map	Open pluvial map
Down Ampney	DA_2	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	10	0.43	0.43	10	No constraints	Open fluvial map	Open pluvial map
Down Ampney	DA_5A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	8	0.79	0.79	19	No constraints	Open fluvial map	Open pluvial map
Down Ampney	DA_5C	0	0	0	0	100	0	0	1.14	0.00	0.11	0.11	Very Low	44	2.35	2.35	58	Flood risk from other sources	Open fluvial map	Open pluvial map
Down Ampney	DA_8	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	13	0.52	0.52	12*	No constraints	Open fluvial map	Open pluvial map
Down Ampney	DA_9	0	0	0	0	100	0	0.02	0.11	0.00	0.03	0.03	Very Low	19	0.76	0.76	18*	Flood risk from other sources	Open fluvial map	Open pluvial map
Fairford	F_32	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	11	0.46	0.46	11	No constraints	Open fluvial map	Open pluvial map
Fairford	F_35B	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	49	1.97	1.97	49	No constraints	Open fluvial map	Open pluvial map
Fairford	F_44	0	0	0	0	100	0	0	5.22	0.00	0.52	0.52	Low	28	1.14	1.14	28	Flood risk from other sources	Open fluvial map	Open pluvial map
Fairford	F_46	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	21	0.79	0.79	19*	No constraints	Open fluvial map	Open pluvial map
Kemble	K_1B	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	16	0.54	0.54	13*	No constraints	Open fluvial map	Open pluvial map
Kemble	K_2	0	0	0	0	100	0	0	0.03	0.00	0.00	0.00	Very Low	12	0.98	0.98	24	Flood risk from other sources	Open fluvial map	Open pluvial map
Kemble	K_5	0	0	0	0	100	0	0.05	5.5	0.00	0.60	0.60	Low	11	0.56	0.56	13	Flood risk from other sources	Open fluvial map	Open pluvial map
Lechlade	L_18B	0	0	0	0.56	99.44	0	0	0	0.06	0.00	0.06	Extremely Low	9	0.54	0.54	13	A very small area of the site is located in FZ2. It should be possible to avoid locating buildings within this area. Otherwise the site is not constrained.	Open fluvial map	Open pluvial map
Lechlade	L_19	2.66	5.57	5.57	19.45	80.55	0	0	0.11	23.60	0.01	23.61	Very Low	9	0.95	0.77	19	A significant percentage of the site is located within FZ3b, 3a and 2. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site would be necessary.	Open fluvial map	Open pluvial map
Mickleton	MK_4	0	0	0	0	100	0	0	7	0.00	0.70	0.70	Low	8	0.59	0.59	14	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_12A	0	0	0	0	100	0	0.02	3.7	0.00	0.39	0.39	Very Low	68	3.59	3.59	89	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_14A	0	0	0	0	100	0.75	2.76	11.51	0.00	6.41	6.41	Low	128	4.64	4.64	115*	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_14B	0	0	0	0	100	0	0	12.46	0.00	1.25	1.25	Low	39	2.16	2.16	54	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_14C	0	0	12.47	12.47	87.53	3.62	10.34	37.26	7.48	26.12	33.60	Medium	77	4.25	3.72	93	A significant proportion of this site is located within FZ3a (considering climate change). Potential for surface water drainage constraints are indicated with a flow pathway running across the centre of the site.	Open fluvial map	Open pluvial map

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Total units planned	Area ha	Area ha in FZ1	Potential houses in FZ1	Sequential test for single site	Link to fluvial map	Link to pluvial map
Moreton-in-Marsh	M_19A	0	0	0	0	100	0.17	0.37	5.75	0.00	1.51	1.51	Low	75	14.02	14.02	350	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_19B	0	0	5.32	5.32	94.68	1.89	6.23	12.65	3.19	13.79	16.98	Low	75	4.64	4.40	109	A small area to the north of the site is within FZ3a and 2. If building is avoided within this area, development of the site should not be constrained, although maintaining dry access to this site would need to be addressed (assuming access would be from Fossey Avenue to the north).	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_21	0	0	0	0	100	1.21	3.14	11.73	0.00	8.34	8.34	Low	245	17.36	17.36	434	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_29	0	0	100	100	0	95.72	96.73	98.36	60.00	425.31	485.31	Very High	3	0.15	0.00	0	Site is entirely within FZ2, Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Exception Test required in FZ2 for Highly Vulnerable use. Potential for surface water drainage constraints are indicated at this site.	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_51	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	3	0.04	0.04	1*	No constraints	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_56	0	0	62.69	62.69	37.31	4.1	6.58	14.21	37.61	21.65	59.27	Low	3	0.09	0.03	0	The majority of the site is within FZ2. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Exception Test required in FZ2 for Highly Vulnerable use	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_57	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	8	0.31	0.31	7*	No constraints	Open fluvial map	Open pluvial map
Moreton-in-Marsh	M_60	0	0	0	0	100	3.6	4.44	16.26	0.00	18.05	18.05	Low	19	0.79	0.79	19	Flood risk from other sources	Open fluvial map	Open pluvial map
Northleach	N_13B	0	0	0	0	100	0	0	5.11	0.00	0.51	0.51	Low	5	0.16	0.16	3*	Flood risk from other sources	Open fluvial map	Open pluvial map
Northleach	N_14B	0	0	0	0	100	0	0	0.3	0.00	0.03	0.03	Very Low	34	2.73	2.73	68	Flood risk from other sources	Open fluvial map	Open pluvial map
Northleach	N_1A	0	0	0	0	100	0	0	0.02	0.00	0.00	0.00	Very Low	31	1.79	1.79	44	Flood risk from other sources	Open fluvial map	Open pluvial map
Northleach	N_8	0	0	0	0	100	0	1.95	8.66	0.00	2.82	2.82	Low	24	0.51	0.51	12*	Flood risk from other sources	Open fluvial map	Open pluvial map
Siddington	SD_3	0	0	0	0	100	1	1.53	3.46	0.00	5.21	5.21	Very Low	40	1.62	1.62	40	Flood risk from other sources	Open fluvial map	Open pluvial map
South Cerney	SC_13A	0	0.41	0.96	0.41	99.59	0	0	0.32	0.93	0.03	0.96	Very Low	34	3.41	3.39	84	A very small area of the site is located in FZ2. It should be possible to avoid locating buildings within this area. Otherwise the site is not constrained.	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_14	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	73	2.09	2.09	52*	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_20	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	87	2.84	2.84	70*	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_22B	0	0	0	0	100	0	0	0.4	0.00	0.04	0.04	Very Low	73	5.52	5.52	138	Flood risk from other sources	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_34A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	48	0.94	0.94	23*	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_34B	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	9	0.30	0.30	7*	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_46	0	0	0	0	100	0	0	3.48	0.00	0.35	0.35	Very Low	20	0.85	0.85	21	Flood risk from other sources	Open fluvial map	Open pluvial map
Stow-on-the-Wold	S_8A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	17	0.18	0.18	4*	No constraints	Open fluvial map	Open pluvial map
Tetbury	T_24B	0	0	0	0	100	0	0	0.08	0.00	0.01	0.01	Very Low	10	0.41	0.41	10	Flood risk from other sources	Open fluvial map	Open pluvial map
Tetbury	T_31B	0	0	0	0	100	0	0	2.56	0.00	0.26	0.26	Very Low	20	2.27	2.27	56	Flood risk from other sources	Open fluvial map	Open pluvial map
Tetbury	T_38	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	12	1.59	1.59	39	No constraints	Open fluvial map	Open pluvial map
Tetbury	T_51	0	0	0	0	100	3.21	14.24	34.04	0.00	28.33	28.33	Medium	19	0.77	0.77	19	Flood risk from other sources. Potential for surface water drainage constraints are indicated at this site although the area of ponding modelled may represent an error in the ground model.	Open fluvial map	Open pluvial map
Tetbury	T_61	0	0	0	0	100	0	0	0.94	0.00	0.09	0.09	Very Low	100	2.09	2.09	52*	Flood risk from other sources	Open fluvial map	Open pluvial map

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Total units planned	Area ha	Area ha in FZ1	Potential houses in FZ1	Sequential test for single site	Link to fluvial map	Link to pluvial map
Upper Rissington	UR_2	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	21	0.84	0.84	20*	No constraints	Open fluvial map	Open pluvial map
Willersey	W_10	0	0	0	0	100	0	0.03	12.32	0.00	1.26	1.26	Low	11	0.45	0.45	11	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_1A	0	0	0	0	100	0	0	1.2	0.00	0.12	0.12	Very Low	2	0.05	0.05	1*	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_1B	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	3	0.13	0.13	3	No constraints	Open fluvial map	Open pluvial map
Willersey	W_4	0	0	0	0	100	0.02	1.18	14.03	0.00	2.65	2.65	Low	38	2.01	2.01	50	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_4B	0	0	0	0	100	0	0.52	11.31	0.00	1.65	1.65	Low	45	1.82	1.82	45	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_5	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	17	1.40	1.40	35	No constraints	Open fluvial map	Open pluvial map
Willersey	W_7A	0	0	0	0	100	0.01	0.03	1.71	0.00	0.23	0.23	Very Low	75	3.95	3.95	98	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_8A	0	0	0	0	100	2.4	5.42	26.71	0.00	16.08	16.08	Medium	31	3.31	3.31	82	Flood risk from other sources. Potential for surface water drainage constraints are indicated at this site with a major surface water flow pathway indicated running south to north across the eastern side of the site.	Open fluvial map	Open pluvial map
Willersey	W_8B	0	0	0	0	100	0.91	3.12	19.95	0.00	8.15	8.15	Low	27	2.89	2.89	72	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	W_9	0	0	0	0	100	8.36	26.22	69.95	0.00	61.05	61.05	High	21	0.87	0.87	21	Flood risk from other sources. Potential for surface water drainage constraints are indicated at this site with two major surface water flow pathways indicated running south to north and joining at the northern end of this site.	Open fluvial map	Open pluvial map

* Where this estimate number is lower than the planned number the reason may be due to the fact that the average density of 25 houses / hectares is too low for the sites concerned.

Table 4-2: Sequential Test for SELAA sites

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Sequential test for single site	Link to fluvial map	Link to pluvial map
Bourton-on-the-Water	BOW_E1	0	0	0.28	0.28	99.72	3.77	5.81	13.77	0.17	19.74	19.91	Low	A very small percentage of the northern edge of the site lies in Flood Zone 3a (considering climate change). It should be possible to avoid locating buildings within this area. Otherwise the site is not constrained.	Open fluvial map	Open pluvial map
Bourton-on-the-Water	BOW_E3	0	0	0	0	100	0	1.03	6.32	0.00	1.66	1.66	Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Bourton-on-the-Water	BOW_E4	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Chipping Campden	CCN_E1	0	0	0	0	100	0.57	1.25	2.93	0.00	3.44	3.44	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Chipping Campden	CCN_E3A	0	0	1.3	1.3	98.7	0.93	0.99	3.89	0.78	4.48	5.26	Very Low	A very small percentage of the eastern edge of the site lies in Flood Zone 3a (considering climate change). It should be possible to avoid locating buildings within this area. Otherwise the site is not constrained.	Open fluvial map	Open pluvial map
Chipping Campden	RUR_E19	0	0	0	0	100	0	0	2.05	0.00	0.21	0.21	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	CIR_E10	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Cirencester	CIR_E11	5.58	5.58	5.58	5.59	94.41	1.66	10.6	48.55	36.83	20.98	57.81	Medium	A watercourse runs across the north eastern edge of the site and hence a small percentage of the site lies in Flood Zone 3b. Potential for surface water drainage constraints are indicated at this site with a large area of ponding modelled.	Open fluvial map	Open pluvial map
Cirencester	CIR_E12	0	0	0	0	100	0	0	0.3	0.00	0.03	0.03	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	CIR_E13	0	0	0	0	100	0	0	1.14	0.00	0.11	0.11	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	CIR_E14	4.51	6.66	41.42	85.38	14.62	0.61	4.46	13.5	58.46	7.84	66.30	Low	Site contains a small area within FZ3b, with most of the remainder of the site in FZ2. Development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site would be necessary.	Open fluvial map	Open pluvial map
Cirencester	CIR_E20	0	0	0	0	100	0	0.15	1.07	0.00	0.26	0.26	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	CIR_E4A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Cirencester	CIR_E5	0	0	0	0	100	0.32	0.54	3.46	0.00	1.95	1.95	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Cirencester	CIR_E6	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Lechlade	LEC_E1	0	0	0	0	100	0	0.02	0.63	0.00	0.08	0.08	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Lechlade	LEC_E2A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E11	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E4	0	0	4.67	4.67	95.33	1.66	5	21.03	2.80	12.63	15.43	Medium	A small percentage of the south west of the site lies in Flood Zone 3a (considering climate change). It should be possible to avoid locating buildings within this area. Potential for surface water drainage constraints are indicated at this site with a flow pathway running NE to SW across the site.	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E5	0	0	0	0	100	3.87	5.8	14.34	0.00	20.12	20.12	Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E6	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E7	0	0	0	0	100	8.21	10.72	16.33	0.00	39.69	39.69	Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E8	0	0	0	0	100	0.43	0.85	13.82	0.00	3.66	3.66	Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Moreton-in-Marsh	MOR_E9A	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Northleach	NOR_E3A	0	0	0	0	100	0	0	0.02	0.00	0.00	0.00	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
South Cerney	RUR_E12	0	51.17	53.23	51.17	48.83	0	0.31	2.29	82.90	0.54	83.44	Very Low	A large area of the site is within FZ3a considering climate change. Development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site would be necessary.	Open fluvial map	Open pluvial map
South Cerney	RUR_E13	1.89	1.89	1.89	72.33	27.67	0.06	1.08	33.98	19.52	4.68	24.20	Medium	A large area of the site is within FZ2. Development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Only water compatible development is permitted within FZ3b, or Essential Infrastructure if an Exception Test is passed. Exception Test required for More Vulnerable use in FZ3a and Highly Vulnerable use in FZ2. Sequential planning of the site would be necessary. Potential for surface water drainage constraints are indicated at this site with the north and west sides of the site indicated as a potential ponding area.	Open fluvial map	Open pluvial map
Stow-on-the-Wold	STW_E1	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	STW_E7	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Stow-on-the-Wold	STW_E9	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Tetbury	TET_E1	0	0	0	0	100	0	3.05	7.33	0.00	3.78	3.78	Low	Flood risk from other sources	Open fluvial map	Open pluvial map

Settlement	Site code	% Flood Zone 3b	% Flood Zone 3a	% Flood Zone 3a plus CC	% Flood Zone 2	% Flood Zone 1	% FMfSW 30yr	% FMfSW 100yr	% FMfSW 1000yr	FZ score	FMfSW score	Total Score	Potential surface water drainage constraints	Sequential test for single site	Link to fluvial map	Link to pluvial map
Tetbury	TET_E2	0	0	0	0	100	0	0	0	0.00	0.00	0.00	Extremely Low	No constraints	Open fluvial map	Open pluvial map
Tetbury	TET_E4	0	0	0	0	100	0	0	0.1	0.00	0.01	0.01	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map
Willersey	WIL_E1C	0	0	0	0	100	0.01	0.03	1.71	0.00	0.23	0.23	Very Low	Flood risk from other sources	Open fluvial map	Open pluvial map

Table 4-3: Sequential Test for SHLAA settlements.

Settlement	Total housing demand	Potential houses in FZ1	Sequential test for the area
Andoversford	41	95	No constraints
Blockley	122	159	Development should be allocated in FZ1. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. A small percentage of the sites bordering with the watercourse are in FZ2 & 3. Some sites present a low risk from surface water being crossed by surface water flow path mainly running from south to north. Potentially all the houses planned could be located in FZ1. Sequential planning of the sites would be necessary.
Bourton-on-the-Water	56	39*	No major constraints. The site B_32 presents a low risk from surface water due to a pond in the central area. The AStGWF map suggests the area is mostly in the highest category of risk of groundwater flood emergence. There are known problems with sewer flooding. These should be considered in the site-specific FRAs and mitigated.
Broad Campden	47	47	No major constraints. Both sites present a low risk from surface water along the north borders bordering with a watercourse. This should be considered in the site-specific FRAs and mitigated.
Chipping Campden	396	436	No major constraints. 7 sites out of 12 present a very low or low risk from surface mainly due to ponding and no site seem to be affected by major surface water flow path. This should be considered in the site-specific FRAs and mitigated.
Cirencester	2660	3013	Development should be allocated in FZ1. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Only the site C_89 bordering with the Daglingworth Stream is in FZ2 & 3. All sites present a very low or low risk from surface water but one with no risk and one with Medium risk mainly due to ponding and no site seems to be affected by major surface water flow path. The AStGWF map suggests a varied risk (low to high risk) of groundwater flood emergence, with the highest risk indicated in Upper Siddington. Different groundwater related incident have been reported. The Environment Agency's Risk of Flooding from Reservoirs map (REF) suggests that there is a risk of reservoir flooding from The Mansion Lake at Cirencester Park. Sewer flooding have been reported in some areas. Potentially all the houses planned could be located in FZ1. Sequential planning of the sites would be necessary.
Down Ampney	118	141	No major constraints. Few sites present a very low risk from surface water mainly due to ponding and no site seems to be affected by major surface water flow path. The AStGWF map suggests that most of the area is identified as having a medium risk of groundwater flood emergence. Sewer flooding issues have been reported but no local evidence of sewer flooding was found. These should be considered and mitigated.

Settlement	Total housing demand	Potential houses in FZ1	Sequential test for the area
Fairford	109	107*	No major constraints. One site present a low risk from surface water mainly due to ponding and no site seems to be affected by major surface water flow path. The AStGWF map suggests that most of the area is identified as having a high risk of groundwater flood emergence. There are known problems with foul sewer flooding. These should be considered and mitigated.
Kemble	39	50	No major constraints. Few sites present a very low and low risk from surface water mainly due to ponding and no site seems to be affected by major surface water flow path. Sewer flooding issues have been reported. These should be considered and mitigated.
Lechlade	18	32	Development should be allocated in FZ1. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Both sites are at risk of flooding from the Downington Ditch. Site L_19 is bordering with FZ2 and one is mainly inside FZ2 with a small percentage inside FZ 3. Site L_18B present a very low risk from surface water without being affected by major surface water flow path. The AStGWF map suggests that the area is in the highest category of risk of groundwater flood emergence. Some sewer flooding problems were reported in 2012. Potentially all the houses planned could be located in FZ1. Sequential planning of the sites would be necessary.
Mickleton	8	14	No major constraints. The site present a low risk from surface water in the southern part due to ponding. The AStGWF map suggests that the area is mostly in the highest category of risk of groundwater flood emergence. Surface water inundated sewers in the 2007 flood event. This should be considered and mitigated.
Moreton-in-Marsh	743	1271	Development should be allocated in FZ1. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. Four out of twelve sites are in FZ2. Of these site M_29 is completely inside FZ2 and site M_56 is more than 60% in FZ2. Potentially all the houses planned could be located in FZ1 and the development planned for the two sites highly affected by flooding should be steered to the other sites. All sites but two present a low risk from surface water. Of these site M14C presents a medium risk and site M_29 a very high risk. Sites M_14A, M_14B and M_14C are crossed by surface water flow path. The AStGWF map suggests that most of the area is in the highest category of risk of groundwater flood emergence. Sewer flooding incident have been recorded in the area. Sequential planning of the sites would be necessary.
Northleach	134	167	No major constraints. All sites present a very low and low risk from surface water mainly due to ponding and no sites are predicted to be affected by major surface water flow paths. Sewer flooding incidents have been recorded in the area. These should be considered in the site-specific FRAs and mitigated.
Siddington	40	40	No major constraints. The site SD_3 presents a very low risk from surface water due to ponding. This should be

Settlement	Total housing demand	Potential houses in FZ1	Sequential test for the area
			considered in the site-specific FRA and mitigated.
South Cerney	34	84	Development should be allocated in FZ1. Residential development should only be allocated within FZ2 if there is insufficient developable land available within FZ1. A small percentage of the southern part of the site is in FZ2 & 3. The site presents a low risk from surface water being crossed by surface water flow path mainly running from south to north. The AStGWF map suggests the area is mostly in the highest category of risk of groundwater flood emergence. Sewer flooding incidents have been recorded in the area. Potentially all the houses planned could be located in FZ1. Sequential planning of the site would be necessary.
Stow-on-the-Wold	327	315*	No major constraints. Two sites out of seven present a very low risk from surface water mainly due to ponding. Few sewer flooding incidents have been recorded but there are not local evidence of foul sewer flooding. These should be considered and mitigated.
Tetbury	161	176	No major constraints. Most sites present a very low risk from surface and one a medium risk mainly due to ponding and one site is predicted to be affected by a surface water flow path. This should be considered in the site-specific FRAs and mitigated.
Upper Rissington	21	20*	No constraints
Willesley	270	418	No major constraints. Most sites present a very low or low risk from surface water, one a medium risk and one a high risk mainly due to surface water flow path having all of them one or more boundaries bordering with the local watercourses. This should be considered in the site-specific FRAs and mitigated.
Total	5344	6624	

* Where this estimate number is lower than the planned number the reason may be due to the fact that the average density of 25 houses / hectares is too low for the sites concerned.

Table 4-4: Sequential Test for SELAA settlement.

Settlement	Sequential test for the area
Bourton-on-the-Water	Development should be allocated in FZ1. The site BOW_E1 located between the local drain and the River Eye has a small percentage along the boundary inside FZ2 and is at low risk from surface water due to a flow path running on the southern part. The site BOW_E3 presents a low risk from surface water due to ponding. The AStGWF map suggests the area is mostly in the highest category of risk of groundwater flood emergence. There are known problems with sewer flooding. These should be considered in the site-specific FRAs and mitigated.
Chipping Campden	Development should be allocated in FZ1. A small percentage of the site CCN_E3A bordering with one of the watercourse is in FZ2. All sites present a very low risk from surface water due to ponding. Sequential planning of the sites would be necessary.

Settlement	Sequential test for the area
Cirencester	Development should be allocated in FZ1. Only the two sites CIR_E14 and CIR_E10 bordering with the Daglingworth Stream are in FZ2 & 3. CIR_E14 has 85% in FZ2. Five out of nine sites present a very low or low risk from surface water and one presents a medium risk mainly due to ponding with one site presenting a surface water flow path. The AStGWF map suggests a varied risk (low to high risk) of groundwater flood emergence, with the highest risk indicated in Upper Siddington. Different groundwater related incident have been reported. The Environment Agency's Risk of Flooding from Reservoirs map suggests that there is a risk of reservoir flooding from The Mansion Lake at Cirencester Park. Sewer flooding have been reported in some areas. Sequential planning of the site would be necessary.
Lechlade	No major constraints. The site LEC_E1 close to Butlers Court Drain presents a very low risk from surface water due to ponding. The AStGWF map suggests that the area is in the highest category of risk of groundwater flood emergence. Some reports of sewer flooding problems in 2012. These should be considered in the site-specific FRAs and mitigated.
Moreton-in-Marsh	Development should be allocated in FZ1. Only a small percentage of one (MOR_E4) out of seven sites that is crossed by one of the local drain is in FZ2. This site presents also a medium risk from surface water being crossed by a surface water flow path. Other three sites present a low risk from surface water due to ponding and the largest one is crossed by a surface water flow path that run from north to south and join the local watercourse. The AStGWF map suggests that most of the area is in the highest category of risk of groundwater flood emergence. Sewer flooding incidents have been recorded in the area. Sequential planning of the sites would be necessary.
Northleach	No major constraints. The site NOR_E3A has a very low risk from surface water due to ponding on the road next to it. Sewer flooding incidents have been recorded in the area. These should be considered in the site-specific FRA and mitigated.
South Cerney	Development should be allocated in FZ1. Both sites, RUR_E12 and RUR_E13, are in FZ2 & 3. Site RUR_E12 is almost 55% inside FZ3 and has a very low risk of flooding from surface water. The other site is more than 70% in FZ2 and has a medium risk of flooding from surface water. The AStGWF map suggests the area is mostly in the highest category of risk of groundwater flood emergence. Sewer flooding incidents have been recorded in the area. Sequential planning of the site would be necessary.
Stow-on-the-Wold	No constraints.
Tetbury	No major constraints. Two out three sites present a very low and low risk from surface water due to ponding. This should be considered and mitigated.
Willesey	No major constraints. The site WIL_E1C presents a very low risk from surface water due to ponding. This should be considered and mitigated.

4.1 SHLAA sites

29 sites out of 92 do not present any constraints, 11 are inside FZ 2 or 3 and 52 are at risk from surface water.

Of the sites inside FZs 4 are partially in FZ3b with percentage that vary from 2.7% to 11.5% and 5 partially in FZ3a with percentage that vary from 5.6% to 11.5%. The percentage in F2 vary from 5.3% to 19.5% with one site 100%, one 88.5% and one 62.7%. These are the sites with the highest score.

Of the site affected by surface water 18 are inside the 30yr FMfSW with percentage that vary from 0.01% to 8.5%, 31 inside the 100yr FMfSW with percentage that vary from 0.01% to 26%. The percentage in the 1000yr FMfSW vary from 0.02% to 34% with one site 70%.

4.2 SELAA sites

11 sites out of 34 do not present any constraints, 7 are inside FZ 2 or 3 and 16 are at risk from surface water.

Of the sites inside the Flood Zones 3 are in FZ3b with percentage that vary from 1.9% to 5.9% and 4 in FZ3a with percentage that vary for 3 of them from 1.9% to 6.6% and one with 51%. The percentage in F2 vary from 0.3% to 5.6% with one site 85%, one 72% and one 51%. These are the sites with the highest score.

Of the site affected by surface water 6 are inside the 30yr FMfSW with percentage that vary from 0.01% to 8.2%, 10 inside the 100yr FMfSW with percentage that vary from 0.02% to 10.7%. The percentage in the 1000yr FMfSW vary from 0.02% to 16.33%.

4.3 SHLAA settlements

2 settlements out of 19 do not present any constraints, 5 have one or more sites in FZ2 or FZ3, 12 present risk from surface water. The estimation used to calculate the "Potential houses in FZ1" shows that all the settlements with sites in FZ 2 or FZ3 can accommodate the planned numbers. Where this estimate number is lower than the planned number the reason may be due to the fact that the average density of 25 houses / hectares is too low for the sites concerned.

4.4 SELAA settlements

One settlement of the 10 does not present any constraints, 5 have one or more sites in FZ2 or FZ3, 4 present risk from surface water. There was no target metric available for SELAA sites equivalent to the housing targets for SHLAA sites. However, the conclusion of the SELAA settlements is that most settlements have no or minor flood risk related constraints on provision of employment land, with the exception of South Cerney which has significant constraints.

This page is intentionally left blank

5 Conclusion

The Sequential Test carried out in this study is appropriate for informing the allocation of housing and employment sites.

The scoring system adopted in this study is based upon the percentage of the site contained within each flood outline multiplied by the probability of that outline occurring.

The results presented in this study should be integrated with the information presented in the SFRA and other relevant documents or data available.

The Sequential Test does not need to be applied for individual developments on sites which have been allocated in development plans through the Sequential Test. However, where allocated sites contain areas of flood risk, their site-specific Flood Risk Assessments (FRAs) should demonstrate that the site has been sequentially planned, and some sites will require an Exception Test to be passed. On a small number of sites, flooding presents a major constraint, suggesting they might not be suitable for development.

At a settlement level the estimation used to calculate how many houses could be allocated in FZ1 indicates that all settlements should be able to accommodate the demand predicted by the SHLAA within Flood Zone 1. For employment land, South Cerney is the settlements that may present considerable constraints which other settlements have no or minor constraints according to the type of employment uses will be planned.

JBA
consulting

Offices at

Coleshill

Doncaster

Edinburgh

Haywards Heath

Limerick

Newcastle upon Tyne

Newport

Saltair

Skipton

Tadcaster

Thirsk

Wallingford

Warrington

Registered Office

South Barn

Broughton Hall

SKIPTON

North Yorkshire

BD23 3AE

t:+44(0)1756 799919

e:info@jbaconsulting.com

Jeremy Benn Associates Ltd

Registered in England

3246693



Visit our website
www.jbaconsulting.com